Disjunct populations of spinifex-obligate reptiles revealed in a newly described vegetation community near Broken Hill, far-western New South Wales

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ABSTRACT

Recent biodiversity surveys of the Barrier Ranges in far western New South Wales resulted in the discovery of an undescribed vegetation community dominated by spinifex grass growing on rocky ranges. Reptile surveys within this vegetation community revealed the presence of three reptile species not known to, or predicted to occur in the Broken Hill Complex Bioregion. These were the Spinifex Snake-lizard *Delma butleri*, Marble-headed Snake-lizard *Delma australis* and Southern Spinifex Slender Blue-tongue *Cyclodomorphus melanops elongatus*. The conservation value of these populations is regarded as regionally significant. All three species were detected by hand-searches of the spinifex grass highlighting the need to use experienced herpetologists when conducting reptile surveys in complex microhabitats. Their presence in the study area on a rocky substrate provides additional information on their habitat requirements in New South Wales.

Key words: Barrier Ranges, mallee, spinifex, reptile, *Delma, Cyclodomorphus*, western NSW, habitat, Broken Hill Bioregion

Introduction

The flora and fauna of arid and semi-arid areas of Australia has been the subject of decades of research across a plethora of regions and vegetation communities. Yet ongoing surveys continue to yield new discoveries which build on our limited knowledge of communities and species in these landscapes (Armstrong and Reid 1992; Sass *et al.* 2005). In 2006, a comprehensive classification of the vegetation communities of western New South Wales was completed which described 213 vegetation communities based primarily on landscape position and vascular plant structure (Benson 2006; Benson *et al.* 2006). However, recent biodiversity surveys for the now approved Silverton Wind Farm in the Barrier Ranges, north-west of Broken Hill in western New South Wales identified the presence of a vegetation community that was not characteristic of these described vegetation communities (nghenvironmental 2008a). This resulted in a newly described vegetation community now known as Porcupine Grass - Red Mallee - Gum Coolibah hummock grassland / low sparse woodland on the pre-Cambian metamorphic ranges in the southern Barrier Range sub-region, north of Silverton (Benson and Sass 2008; Benson 2008). This vegetation community contains a spinifex dominated ground cover while an unusual occurrence of Red Mallee (*Eucalyptus socialis*), a species normally found on sand dunes and sand plains and a western outlying population of Gum Coolibah (*Eucalyptus intertexta*) provide a sparse woodland environment on a metamorphic geology. This community has now been listed as Critically Endangered Ecological Community by the NSW Scientific Committee under the *Threatened Species Conservation Act 1995*.

This paper documents previously unknown populations of three species of spinifex-obligate reptile fauna (Spinifex Snake-lizard *Delma butleri*, Marble-headed Snake-lizard *Delma australis* and Southern Spinifex Slender Blue-tongue *Cyclodomorphus melanops elongatus*) found within this vegetation community which were previously unrecorded in the Broken Hill Complex Bioregion. Aspects of their habitat and conservation status relevant to NSW as well as their detectability are also discussed.

Methods

Reptile surveys were undertaken between September 2007 and November 2008 across a variety of vegetation communities as part of comprehensive biodiversity surveys for the Silverton Wind Farm, approximately 35 kilometres north-west of Broken Hill, in far-western

New South Wales (nghenvironmental 2008a; b) (Figure 1). Preliminary searches of the NSW Atlas of Wildlife database, DECCW Threatened Species predictions for the Bioregion (DECCW 2008a; b) and records of the Australian Museum (Swan *et al.* 2004) provided background information on the reptile species of the Bioregion with all three reptile species, not known to, or predicted to occur in the study area.

With botanical field work across the study area leading to the discovery of this vegetation community, and with the ecological value of spinifex dominant communities to reptile fauna well documented (James and Shine 2000; Morton and James 1988), target surveys for reptile fauna were conducted. The distribution of the vegetation community was found to be disjointed across the study area with each of the seven known patches separated by Mulga Shrublands that were absent of spinifex by a minimum distance of 1.2 km (Figure 2).

Reptile surveys within the spinifex habitat comprised of active hand searches of dead and live spinifex clumps by two people at four of the seven disjunct patches (Figure 2). However, to conserve live spinifex, the majority of clumps searched were of dead spinifex. Two variations of this method were employed. The first variation was to search underneath the spinifex clump to determine the species living underneath the spinifex. This was done by one person using a three-pronged rake to lift the spinifex toward them, while a second person on the opposite side captured any reptiles by hand as the clump was raised resulting in their emergence. The second variation was to search within the spinifex clump. This was done by removing the spinifex from the substrate, and holding this between the surveyor and sunlight. This provided a silhouetted outline of any reptiles inactive within the spines of the spinifex clump. A second person then removed the reptile from the spinifex. Opportunistic sightings of reptiles were also made of rock-obligates basking on rocky outcrops while searching Spinifex clumps. A summary of the survey effort is outlined (Table 1).

Results

Target surveys within the newly described vegetation community revealed the presence of 15 reptile species including the Spinifex Snake-lizard, Marble-headed Snake-lizard and Southern Spinifex Slender Blue-tongue. A full species list is provided (Table 2) with the total numbers of each species the subject of this paper summarised (Table 3). Each individual was identified by experienced persons (Author 1 and 2) and a single voucher specimen of each of the three species was lodged with the Australian Museum, Sydney (GS).

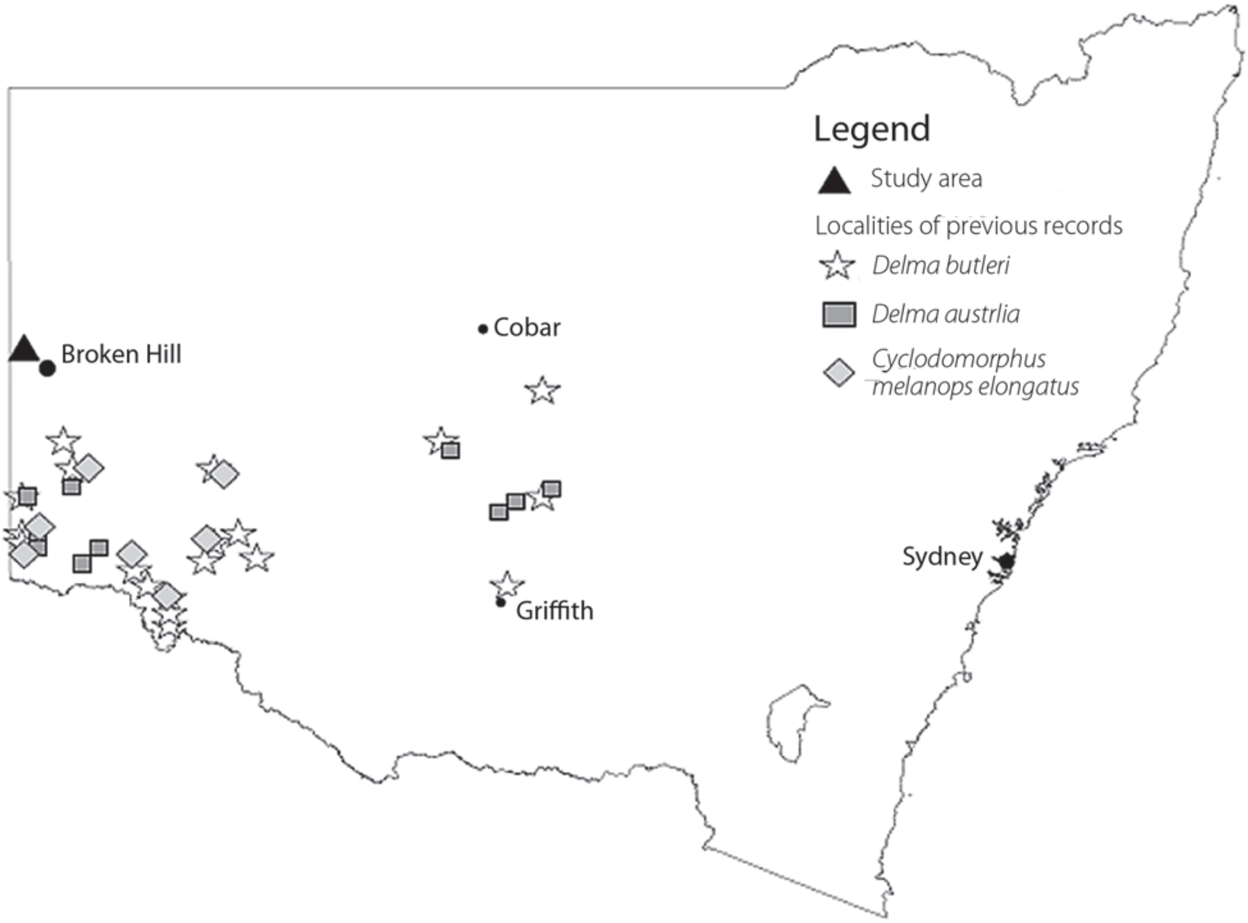

Figure 1. The location of the study area in far-western New South Wales and localities of previous records for the Spinifex Snake-lizard *Delma butleri*, Marble-headed Snake-lizard *Delma australis* and Southern Spinifex Slender Blue-tongue *Cyclodomorphus melanops elongatus* in New South Wales from DECCW 2008a and Swan *et al.* 2004.

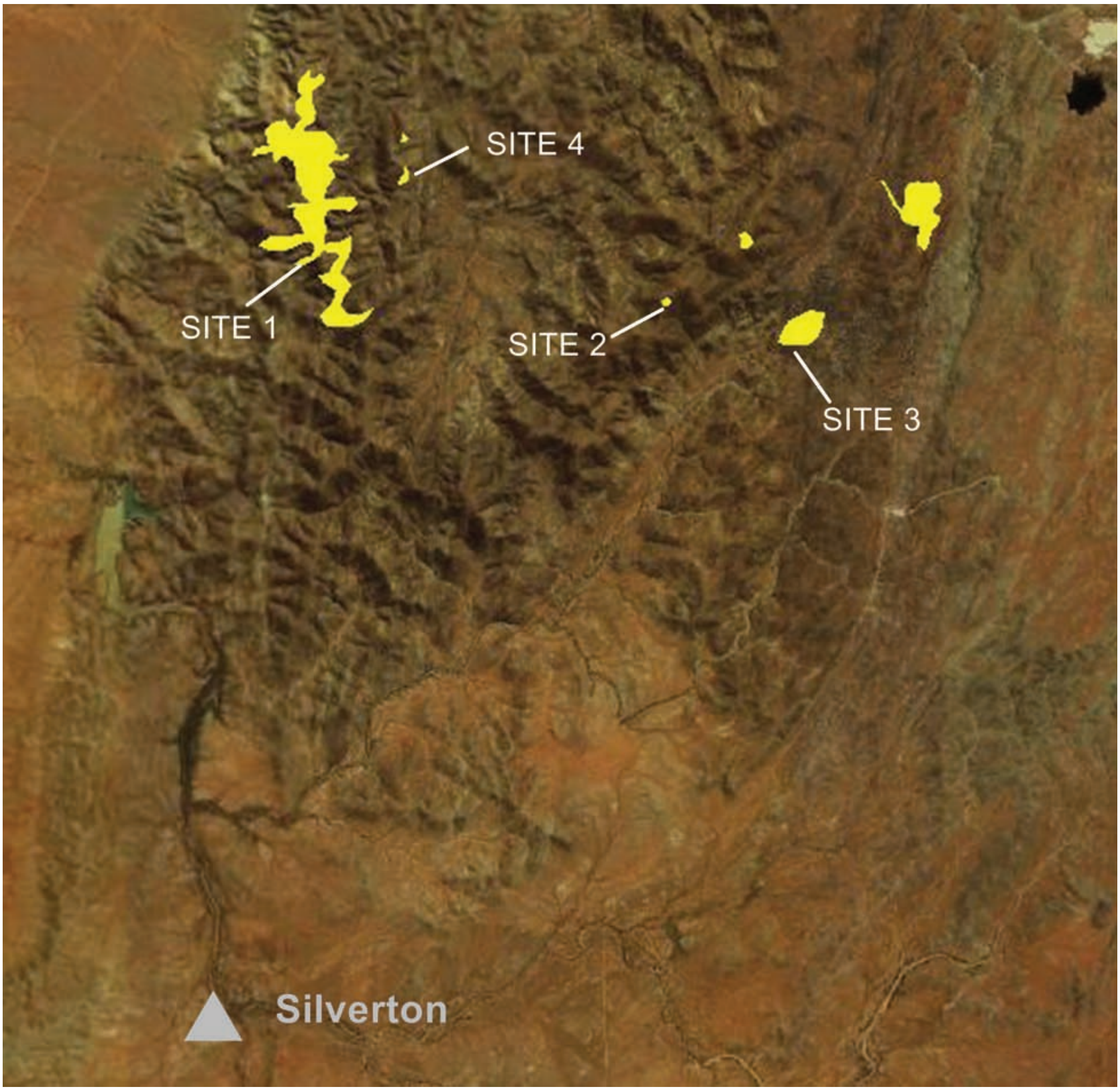

Figure 2. The extent of each patch (yellow polygon) of the newly described vegetation community within the study area.

Table 1. A summary of the survey effort (person hours) employed (Shaded Cell =no survey).

Site No.	Sep 2007	Nov 2007	Aug 2008	Nov 2008
Site 1	6 hr	6 hr		
Site 2	4 hr	2 hr		
Site 3			3 hr	1 hr
Site 4			1hr	

Discussion

Prior to this study, the most current vegetation mapping available, predictions for species occurrence and previous records of the three reptile species (Benson 2006; Benson *et al.* 2006; DECCW 2008a; b) gave no indication that the Spinifex Snake-lizard, Marble-headed Snake-lizard or the Southern Spinifex Slender Blue-tongue might occur in the Broken Hill Complex Bioregion. All three species were previously known to occur in mallee/ spinifex environments on sand dunes and sand plains in NSW (Sass *et al.* 2005; Val *et al.* 2001; Wilson and Swan 2008). However, all spinifex within the study area is growing on rocky ridges dominated by a loose rock substrate with very little sand, confirming that these three species are not confined to sand dunes and sand plains in NSW as previously thought. The ecological value of spinifex-dominant vegetation communities to reptile fauna has been known for some time (Pianka 1966; 1968) with many species restricted to spinifex dominant habitats (Cogger 1969; Cogger and Cameron 1984; Sass 2006; Sass and Wilson 2006) as is the case with these three species in the study area.

Table 2. A list of reptile species recorded within Porcupine Grass – Red Mallee – Gum Coolibah hummock grassland / low sparse woodland on the pre-Cambian metamorphic ranges in the southern Barrier Range sub-region, north of Silverton during this study (Bold denotes threatened species as listed under the *NSW Threatened Species Conservation Act 1995*).

Common Name	Scientific Name
Central Bearded Dragon	*Pogona vitticeps*
Tawny Rock Dragon	*Ctenophorus decressi*
Four-pored Earless Dragon	*Tympanocryptis tetraporophora*
Bynoe's Prickly Gecko	*Heteronotia binoei*
Boulenger's Skink	*Morethia boulengeri*
Western Brown Snake	*Pseudonaja nuchalis*
Tree Dtella	*Gehyra variegata*
Eastern Spiny-tailed Gecko	*Strophorus williamsi*
Spinifex Snake-lizard	*Delma butleri*
Marbled-headed Snake-lizard	*Delma australis*
Southern Spinifex Slender Blue-tongue	*Cyclodomorphus melanops elongatus*
Burton's Legless Lizard	*Liasis burtonsi*
Gidgee Skink	*Egernia stokesii*
Robust Ctenotus	*Ctenotus robustus*
	Ctenotus schomburgkii

Table 3. Total number of individual spinifex-obligate reptiles recorded (Shaded Cell = No survey / D.a=*Delma australis* / D.b=*Delma butleri* / C.m=*Cyclodomorphus melanops elongatus*)

Site No.	Sep 2007			Nov 2007			Aug 2008			Nov 2008		
	D.a	D.b	C.m	D.a	D.b	C.m	D.a	D.b	C.m	D.a	D.b	C.m
Site 1	2	6	2	1	0	1	▨	▨	▨	▨	▨	▨
Site 2	1	2	4	2	1	1	▨	▨	▨	▨	▨	▨
Site 3	▨	▨	▨	▨	▨	▨	5	3	2	2	1	1
Site 4	▨	▨	▨	▨	▨	▨	1	0	0	▨	▨	▨

The study area is isolated from other spinifex habitat in western New South Wales with large areas of Mulga and Chenopod shrublands dominating the wider landscape and extending for more than 100 kilometres in all directions from the study area. A small area of spinifex habitat is known to occur within Mutawintji National Park (approximately 120kms north-east of the study area) (Swan and Foster 2005). Despite intensive surveys of Mutawintjii, none of the three species the subject of this paper have been recorded there (Swan and Foster 2005). Conversely, another spinifex-obligate *Ctenotus brachyonyx*, has been detected at Mutawintji but was not recorded within the study area during our study. To the south, mallee/spinifex environments become common around Coombah Station approximately 140kms from the study area, where all three species are known as well as other spinifex-obligates such as the Jewelled Gecko *Strophorus elderi*, which could also occur within the study area, but remains undetected to date.

The known extent of the newly described vegetation community is very limited, with a total of 300 hectares recorded to date across seven disjunct patches. At present, all patches are separated by Mulga Shrublands by a minimum distance of 1.2km. This isolation suggests that genetic exchange of reptile species between each patch is unlikely given that extensive surveys in surrounding habitat types did not detect these species outside of the spinifex habitat and that these species are unlikely to move across such distances.

Two of the three spinifex-obligates are listed as '*Endangered*' under the NSW *Threatened Species Conservation Act 1995:* the Marble-headed Snake-lizard (*Delma australis*) and Southern Spinifex Slender Blue-tongue (*Cyclodomorphus melanops elongatus*). Conversely, the Spinifex Snake-lizard has no such consideration; however, this population is likely to qualify for listing as an '*Endangered Population*' given criteria such as geographic isolation applicable in this instance.

All three species were detected using an active hand searching technique with a limited amount of search effort needed (Table 1 & 3). Detectability appeared to be influenced by cooler conditions, with the August and September surveys locating animals found sitting on the substrate (ie, between the rock and the spinifex clump). Conversely, surveys conducted when temperatures were higher during November resulted in most animals being found sheltering within the spines of the spinifex clump, and difficult to detect using the visual method. Even in cooler temperatures, all three species moved quickly away from the observers making identification difficult when animals were not hand-captured. This reinforces the requirement of using only experienced herpetologists when undertaking surveys for threatened or significant reptile species or within structurally complex environments such as spinifex.

The detection of these three species in the Barrier Ranges is regarded as highly significant in terms of regional biodiversity and conservation value given their geographic isolation from known populations. Ecologically, previous associations with environments such as sand dunes and sand plains do not exist given the rock substrate of the study area. The non-detection of these species outside of spinifex habitats during the biodiversity surveys supports the premise that each species is a spinifex-obligate in New South Wales.

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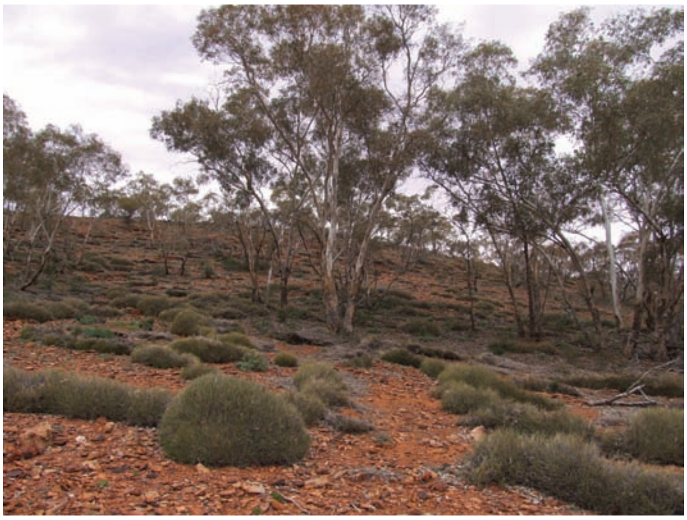
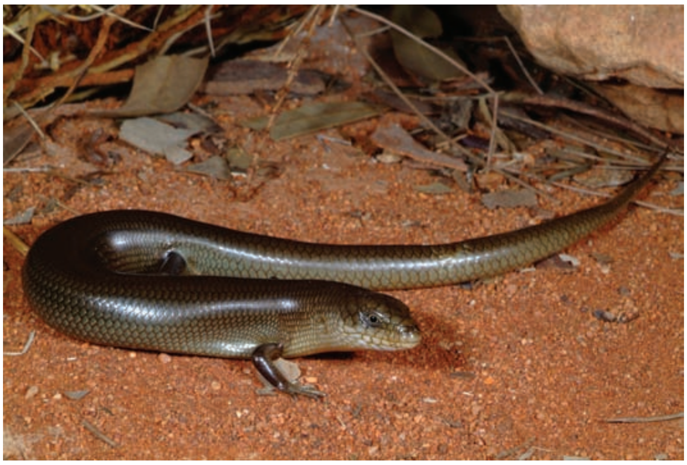
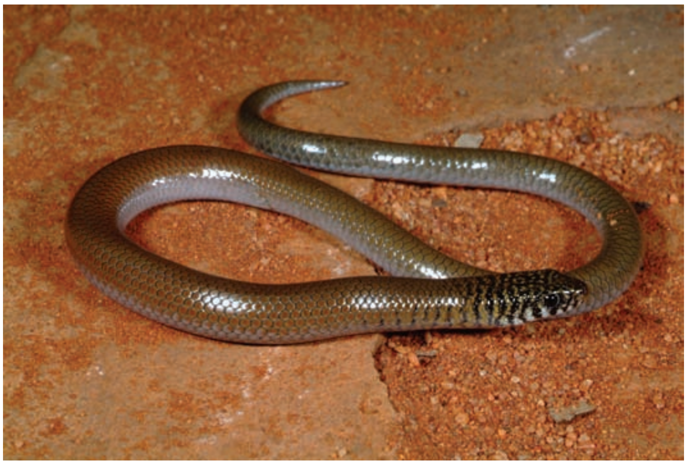
APPENDIX I



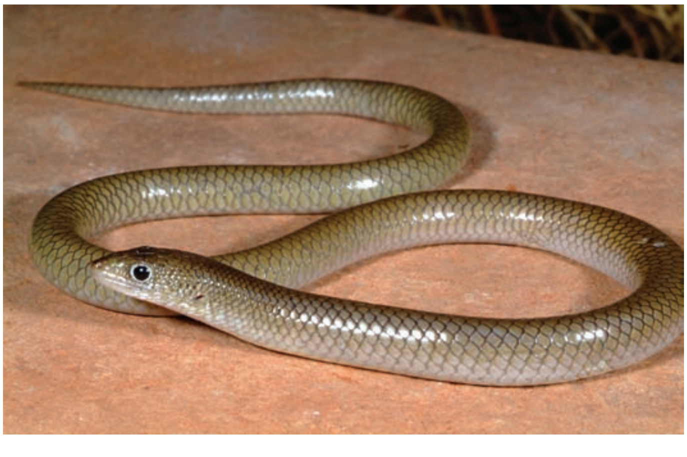
Porcupine Grass – Red Mallee – Gum Coolibah hummock grassland / low sparse woodland on pre-Cambian metamorphic ranges in the southern Barrier Range sub-region, north of Silverton. Photo, S.Sass.



A Southern Spinifex Slender Blue-tongue (*Cyclodomorphus melanops elongatus*) recorded during surveys in the Barrier Ranges near Broken Hill, NSW. Photo, G. Swan.



A Marbled-headed Snake-lizard *Delma australis,* recorded during surveys in the Barrier Ranges near Broken Hill, NSW. Photo, G. Swan.



A Spinifex Snake-lizard *Delma butleri*, recorded during surveys in the Barrier Ranges near Broken Hill, NSW. Photo, G. Swan.

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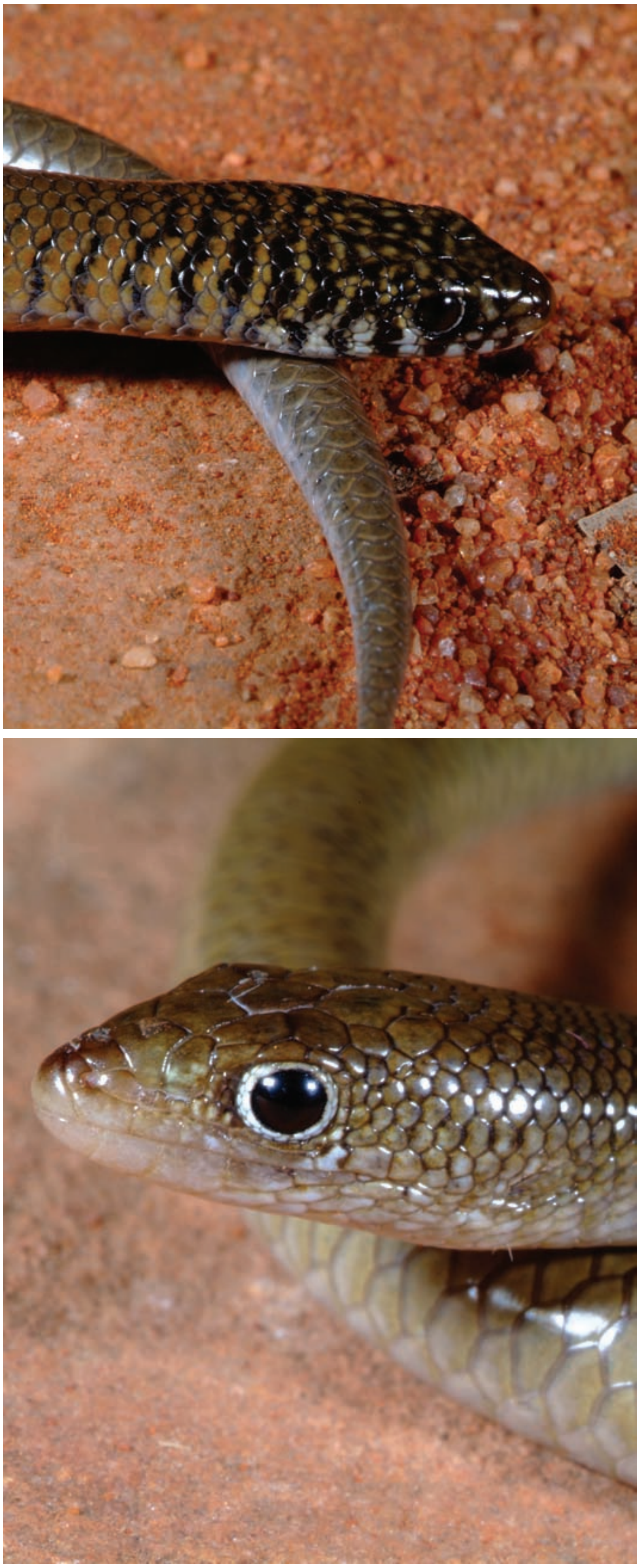

Differences in head markings between *Delma australis* (left) and *Delma butleri* (below left) recorded during surveys in the Barrier Ranges near Broken Hill, NSW. Photos, G. Swan.